MORE ON DARWIN’S ILLNESS: COMMENT ON THE FINAL DIAGNOSIS OF CHARLES DARWIN

by

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Without the possibility of confirmatory exhumation, diagnostic inferences about Darwin’s illness must remain speculative. A diagnosis of Darwin’s aggregate symptoms must account for not only gastrointestinal distress but also his predominant and excessive retching and the conglomerate of other heterogeneous symptoms. We opine that Crohn’s disease, posited as the ‘final diagnosis’, is not sufficient for subsuming his pleiomorphic symptomatology. An additional proposal is outlined that may help to explain his presentation with heterogeneous symptoms. It incorporates constitutional vulnerabilities, psychosomatic influences and Pavlovian conditioning as explanatory variables.

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We read with interest the article by Orrego and Quintana¹ in which the authors make a compelling argument for Crohn’s disease as Darwin’s ‘final diagnosis’. It is of course impossible to verify this conclusion without firm pathological evidence, and thus far personnel at Westminster Abbey have withstood all requests for exhumation. On this point, one can sympathize with the position taken at Westminster Abbey regarding requests to confirm post-mortem speculations. For instance, it was not so long ago that the Abbey was accosted for confirmation of another plausible explanation of his illness, Chagas’ disease, caused by the bite of a vinchuca, the great black bug of the Pampas, which Darwin is supposed to have sustained while on one of his land exploration trips in Argentina.²

Although gastroenterologists and also specialists in internal medicine with expertise in infectious disease have offered opinions, psychiatric disorders such as panic attacks have also been posited as explanations of Darwin’s perplexing illness.³ Crohn’s disease was long regarded as one of the classic psychosomatic diseases, along with eczema, another condition from which Darwin suffered.⁴ Although emotional problems are no longer believed to be causal, clearly the symptoms of Crohn’s disease can be related to stress that exacerbates psychological problems, just as the psychological problems can in turn worsen the manifestation of the former. It seems well documented in Darwin’s clinical history that his

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waxing and waning gastrointestinal complaints did generally increase during times of emotional stress.\textsuperscript{5–7} Assuming that, as argued by Orrego and Quintana, Darwin’s symptoms were the consequence of predominantly upper gastrointestinal Crohn’s disease, then most of his physical symptoms would be accounted for; however, it is also possible that the symptoms of Crohn’s disease reciprocally interact with stress factors, or that psychogenic influences were themselves causal in the gastrointestinal symptoms without the necessity of positing Crohn’s aetiology at all.

Darwin’s chief gastrointestinal complaint seems to have been vomiting. Vomiting is unusual as a predominant feature of Crohn’s disease, but where present it may suggest the presence of intestinal obstruction due to acute inflammation and oedema of the involved intestinal segment; it is not unusual as a component of the symptom complex. The main difficulty for the Crohn’s theory is in accounting for Darwin’s psychological-sounding symptoms, and in particular his vomiting. Although Crohn’s disease is a possible cause of vomiting, it is an exceedingly uncommon one;\textsuperscript{8} the nature, chronicity and frequency of Darwin’s vomiting strongly suggest the possibility of classical or reflex conditioning. This type of subcortical learning involves a response mediated by the autonomic nervous system (for example emesis). The unconditioned stimuli that naturally elicit a sequence of events eventuating in vomiting can include disorders of the alimentary tract, infections, overeating, physical energy changes that affect the receptors in the semicircular canals of the inner ear, and the ingestion of noxious substances (see below). Any previously neutral stimulus that is contiguously associated with preceding unconditioned stimuli can acquire eliciting properties. For Darwin, the frequent vomiting may have come under stimulus control of a wide range of previously neutral stimuli (for example odours, the sight of ocean waves, or the kinaesthetic effects of a rolling ship and a swaying hammock during \textit{Beagle} voyages) that acquired the ability to elicit the conditioned responses of nausea and vomiting. This type of learning readily occurs in natural settings and is the foundation for what is termed ‘aversion therapy’, a treatment for maladaptive appetitive behaviours such as alcoholism.\textsuperscript{9} An unconditioned stimulus, the drug emetine, is initially ingested; it produces nausea and vomiting that in turn is associated with the sight, smell and taste of alcohol. Later, the stimulus properties of the alcoholic beverage elicit disturbances of the alimentary tract. As another example, survivors of Hodgkin’s disease who have experienced emetogenic cancer treatment and developed anticipatory symptoms (namely conditioned nausea and vomiting before the administration of chemotherapy or radiation) will continue to exhibit post-treatment nausea and vomiting conditioned to the smells, sights and tastes that remind them of their treatment.\textsuperscript{10}

Frequent concomitants of such Pavlovian learning would be conditioned anxiety and other emotional states (see Geer\textsuperscript{11}). That is, fear (or anxiety) associated with an aversive event such as retching is paired in time with neutral stimuli, a nexus that again results in classical conditioning. There is evidence that susceptibility to such emotional conditioning is strongly genetically influenced.\textsuperscript{12}

Darwin seems from an early age to have been unusually queasy and weak-stomached. If so, these constitutional features would have predisposed him to the development of associative Pavlovian learning. Even as a young man attempting to follow in his father’s and his brother’s footsteps by pursuing medical studies at Edinburgh University, Darwin found surgery ‘stomach-churning’. He abandoned his medical studies during a particularly poignant operation on a child, during which he fled the room, unable to watch, and determined never again to enter an operating theatre.\textsuperscript{13} His abandonment of this expected career path was a disappointment to his family; eventually, however, it led to Christ’s College, Cambridge—a
half-hearted effort to become a country parson, overshadowed by a voracious appetite for beetle-collecting—and acquaintance with Henslow and a berth on the Beagle. He bore with him on his round-the-world voyage several books including Milton’s Paradise lost, Humboldt’s Personal narrative, and Lyell’s Principles of geology. He also brought his queasy stomach.

As soon as Darwin boarded his incommodious room in the Beagle, he experienced claustrophobia, leaving him in ‘continual fear’; ‘the absolute want of room is an evil’, he wrote, ‘that nothing could surmount’. The Beagle was hardly even underway on its first attempt at departure before Darwin, not surprisingly, realized he was extremely prone to seasickness. According to his biographers, Desmond and Moore,

Charles’s misery began immediately. Nausea nailed him to the rail, and he spewed his breakfast into the swell. Nothing stayed down all day. In the evening a fierce gale came on from the southwest and the Beagle began pitching ‘bows under’ into mountainous waves. It was his worst nightmare. All through the watches he swung violently in his cabin, retching helplessly.14

His journals show that his seasickness did not improve much during the next five years, and the retching continued for the duration of the time he spent aboard the 90-foot sailing ship on the high seas. Once returned to England, he continued to experience bouts of stomach upsets, headaches and flutterings of the heart that laid him up for days on end. Thus in London in 1838, after he had already begun his transmutation notebook, he complained:

I hope I may be able to work on right hard during the next three years … but I find the noodle & stomach are antagonistic powers, and that it is a great deal more easy to think too much in a day, than to think too little—What thought has to do with digesting roast beef,—I cannot say.15

After settling at Downe, he became unusually averse to travel and preferred to remain at home. The famous traveller never again went abroad. This has generally been considered a result of a psychological reluctance to face the conflict occasioned by his unsettling ideas. The advantage was that it allowed him to avoid unnecessary distractions from his work. However, it would also have been the understandable resort of a man for whom the possibility of all travel had become associated with retching and fear.

Accounts of Darwin’s life are replete with detailed and monotonously repetitive accounts of his wretched symptoms, together with his often desperate attempts to resolve them with a series of standard and quack medicines (including bismuth compounds, laudanum, electrical stimulation of the abdomen with a shocking belt, and—successful for a short time—a rigorous regimen of cold showers, vigorous rubbing and body strapping with wet towels. At Dr James Gully’s water cure establishment at Malvern, he also learned to take large amounts of water; this may explain one of his other symptoms, copious and vary pallid urine (see below).

More than 30 years after his retching began on the Beagle, the one-time medical student wrote up a list of his symptoms to the latest of a long line of medical consultants:

For twenty-five years extreme spasmodic daily and nightly flatulence; occasional vomiting, on two occasions prolonged during months. Vomiting preceded by shivering, hysterical crying, dying sensations or half-faint, and copious and very palid urine. Now vomiting and every passage of flatulence preceded by ringing of ears, treading on air and vision. Focus and black dots, air fatigues, specially risky, brings on the head symptoms, nervousness when E[mma] leaves me.16
This hardly sounds like Crohn’s disease; instead the pleiomorphic symptoms are suggestive of those most commonly encountered in those patients with psychosomatic illness. Such patients may wear down even physicians who are able to recognize—behind the confusion of complaints—the genuine person in need; generally such patients require both compassion and strict time limits to forestall the siege promised by the long and detailed list of physical and mental conditions.17

Perhaps, however, the best illumination of Darwin’s symptoms may come from an examination of his own theory. Symptoms such as anxiety, panic, fear and dysphoria probably arise from the part of the brain known as the limbic system and are in turn closely related to specific, generally aversive, visceral experiences related to the gut (the limbic system is therefore sometimes referred to as the visceral brain).18 It has been inferred that this primitive part of the brain began, probably, as a central mechanism for determining what foods should or should not be consumed; through natural selection it eventually developed into the central controller of all the visceral organs and, particularly during hominid evolution, into the centre of emotional control. Moreover, the limbic system of the brain—in particular, the prefrontal/anterior cingulate cortices, amygdala, hippocampus and hypothalamus—are directly connected to afferent feedback from the body, including the viscera, by the vagus nerve. In turn, as explicated by Mayer et al.:

Altered target organ function, such as tachycardia, increased blood pressure, altered respiration, increased sweat production, increased activity of bladder and distal colon, is encoded by visceral afferents which feed back to some of the very same brain regions which were involved in triggering the central autonomic response in the first place …. In addition to possible modulatory effects on the experienced emotional feeling, epinephrine [adrenaline] through an action mediated by vagal afferents plays an important role in enhancing the memory of a particular experience associated with high epinephrine release.19

This, in outline, is a sketch of the neurophysiology of the evolutionary advantages of innate responses to potentially hazardous substances. Visceral irritation results in abnormal vagal nerve stimulation, nausea, vomiting, and adverse emotional reactions.20 This aspect of hominid adaptation is seen as the foundation for a type of classical conditioning in which ingested toxic substances elicit strong emotional reactions in addition to intense vomiting. The survival value of this kind of instinctive response to toxic environmental stimuli is apparent. Darwin himself would possibly have applauded the appellation ‘survival value’ to one of his major, chronic symptoms, that of vomiting in relation to specific noxious substances; he might still have rued his constitutionally weak stomach for making that highly unpleasant response so pervasive.

Although Darwin’s illnesses have attracted a great deal of scholarly comment, with theories falling on both sides of the mind/body divide, it is perhaps safest to assume that whatever it was that ailed him, it was not exclusively physical or psychological but both, and involved reactions and feedbacks across both the brain and the gut (this is, in one sense, a definition of psychosomatic disease). This is an explanation that perhaps would have satisfied Darwin himself, who after all had speculated on the antagonism between the noodle and the stomach.

We do not attempt to refute the diagnosis by Orrego and Quintana of Crohn’s disease; perhaps it will one day be confirmed; perhaps it will be shown to be unnecessary. We cannot prove that classical conditioning alone explains the cycle of vomiting and psychological symptoms that Darwin experienced intermittently throughout his life and that made his life miserable. Far be it from us to speculate about a ‘final diagnosis’. However, we cannot be far
wrong if we suggest that Darwin seems to have suffered physical disease of the gastrointestinal tract of some sort (which may have been Crohn’s disease); that he experienced chronic symptoms, including frequent vomiting, without effective treatment; and that in the process he developed secondary psychological features that may have constituted reflex conditioning. Short of exhuming Darwin from his resting place in Westminster Abbey, we ourselves will have to find rest in such plausible—but necessarily tentative—suggestions.

### Notes

19. Ibid.